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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/527,911	KNEE ET AL.	
	Examiner	Art Unit	
	EUENG-NAN YEH	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 March 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *Mar 14, 2005*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

The drawings are objected to because of following minor informalities:

2. Figure 1 is objected to as depicting a block diagram without "readily identifiable" descriptors of each block, as required by 37 CFR 1.84(n):

> 1.84(n) Symbols. Graphical drawing symbols may be used for conventional elements when appropriate. The elements for which such symbols and labeled representations are used must be adequately identified in the specification. Known devices should be illustrated by symbols which have a universally recognized conventional meaning and are generally accepted in the art. Other symbols which are not universally recognized may be used, subject to approval by the Office, if they are not likely to be confused with existing conventional symbols, and if they are readily identifiable.

Rule 84(n) requires "Labeled representations" of graphical symbols, such as blocks; and any that are "not universally recognized may be used, subject to approval by the office, if they are not likely to be confused with existing conventional symbols, and if they are readily identifiable". In the case of figure 1, the blocks are not readily identifiable *per se* and therefore require the insertion of text that identifies the function of that block. That is, each vacant block should be provided with a corresponding label identifying its function or purpose.

Furthermore, it would be very helpful if you can include extra figures or expand figure 1 to disclose and illustrate the structure of claimed invention without adding new matter.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The title of the invention, “System and method for image processing” is too general to reveal the real intention to which the claims are directed. A new title is suggested: “System and method for video images segmentation processing”.

Claim Objections

4. The following quotations of 37 CFR 1.75(a) and (d)(1) are the basis of objection:

> (a) The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.
>
> (d) (1) The claim or claims must conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

5. Claims 3 and 33 are objected to under 37 CFR 1.75(d)(1), as failing to conform to the invention as set forth in the remainder of the specification.

Claim 3, line 2: “linear functions mapping the vector space”. There is no clear support or antecedent basis for the concept of “linear functions mapping” in the description. Applicant may either point out where or how the original specification describes this limitation, or amend the specification to describe this feature without adding new matter.

Claim 33, line 2: “differences is considered to be zero”. There is no clear support or antecedent basis for the concept of “to be zero” in the description. Applicant may

either point out where or how the original specification describes this limitation, or amend the specification to describe this feature without adding new matter.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-4, 6-8, 12-15, 17-20, 22, 24-27, and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno et al. (IEEE Vol. 8, No. 5, Sep. 1998, 562-571) and Park et al. (US 6,535,632 B1).

Regarding claims 1, Castagno discloses a segmentation system comprising: representing the data as points in a segmentation vector space which is the product of the vector space of feature values and the vector space of pixel addresses (as depicted in figure 2, "Fig. 2 shows a segmentation at the region level. For the sake of simplicity, we have selected a case in which the coherence within each region is based on gray level and color" at page 564, right column, line 1. See also "We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information ..." at page 565, left column, bottom paragraph);

representing segments as locations in the segmentation vector space (as depicted in figures 3-5: "Figs. 3–5 show three examples of how the same segmentation at the region level can yield different segmentations at the object level" at page 564, right column, line 4. See also "We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information ..." at page 565, left column, bottom paragraph);

determining a segment for each pixel by the distance in segmentation vector space from the data point representing the pixel to the location of the segment ("The features that we propose to use in our segmentation scheme belong to four groups (color, motion, position, and texture). Each one is characterized by quite different ranges of possible values ... In order to process this information in parallel, it is therefore necessary to introduce some form of normalization that allows us to define a distance which is easily measurable. A common solution is known as Mahalanobis distance ... The use of the Mahalanobis distance therefore induces a distance between two vectors f_m and f_n in the feature vector space ..." at page 565, right column, bottom paragraph).

Castagno does not explicitly disclose that this distance can be used as membership measurement in the segmentation vector space.

Park, in the same field of endeavor of color image processing ("object tracking and image segmentation" at column 1, line 27), teaches the cluster segmentation determination as depicted in figure 10: "process for allocating input vectors into clusters

is performed for each input vector (step 84). Such process is based upon a minimum distance measure. In various embodiments an euclidean distance, an absolute distance or some other distance measure is used. In one embodiment the euclidean distance is used. An input vector is allocated to a cluster to which it has a minimal euclidean distance with the cluster's prototype vector. At step 86, the prototype vector closest to the input vector is found. As a self-organizing control for allocating data into clusters, a vigilance parameter, also referred to herein as a vigilance value, is used. A vigilance test is performed at step 88. If the minimum euclidean distance is not less than the vigilance value, then a new cluster is defined at step 90. The input vector is assigned to such new cluster and becomes the initial prototype vector for such new cluster. If the minimum euclidean distance is less than the vigilance value, then the input vector is assigned to the cluster corresponding to the closest prototype vector at step 92 …" at column 10, line 37. Thus, the distance determines the membership of input vector.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to be motivated to include the segmentation system Castagno made with membership determination algorithm as taught by Park, in order to properly classify each segment such that “an input vector is allocated to a preexisting cluster or a new cluster” at column 10, line 55.

Regarding claims 12, the Castagno and Park combination teaches a segmentation system comprising:

data is represented as points in a segmentation vector space which is the product of the vector space of feature values and the vector space of pixel addresses (discussed in claim 1, as depicted in Castagno figure 2, “Fig. 2 shows a segmentation at the region level. For the sake of simplicity, we have selected a case in which the coherence within each region is based on gray level and color” at page 564, right column, line 1. See also “We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information ...” at Castagno page 565, left column, bottom paragraph);

segments are represented as locations in the segmentation vector space (as depicted in Castagno figures 3-5: “Figs. 3–5 show three examples of how the same segmentation at the region level can yield different segmentations at the object level” at page 564, right column, line 4. See also “We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information ...” at page Castagno 565, left column, bottom paragraph);

initially assigning pixels to segments according to the segment membership of the respective pixel in the preceding picture in the sequence (“...The segmentation results obtained for the current frame are eventually used as initialization for the FCM

procedure at frame n+1 ..." at Castagno page 568, right column, line 42. Thus, the initially assigning pixels to segments is taken from the preceding picture);

calculating the location in segmentation vector space for each initial segment utilizing feature values from the current picture ("The features that we propose to use in our segmentation scheme belong to four groups (color, motion, position, and texture). Each one is characterized by quite different ranges of possible values ... In order to process this information in parallel, it is therefore necessary to introduce some form of normalization that allows us to define a distance which is easily measurable. A common solution is known as Mahalanobis distance ..." at Castagno page 565, right column, bottom paragraph);

determining the membership of a segment for each pixel according to the distance in segmentation vector space from the data point representing the pixel to the location of the segment (discussed in claim 1, for the determination of the membership of a segment).

Regarding claims 2 and 13, the segments are represented as points (as depicted in Castagno figure 2, "Fig. 2 shows a segmentation at the region level ..." at page 564, right column, line 1. The segments are represented as points).

Regarding claims 3 and 14, the segments are represented as linear functions mapping the vector space of pixel locations to the vector space of pixel values (as depicted in Castagno figure 2, segmented pixel point position (x, y) maps and one-to-

one corresponds to the gray level value of the image. "Fig. 2 shows a segmentation at the region level ... each region is based on gray level and color" at page 564, right column, line 1).

Regarding claims 4 and 15, the distance measure is a Euclidean distance (discussed in claim 1, "...Such process is based upon a minimum distance measure. In various embodiments an euclidean distance, an absolute distance or some other distance measure is used. In one embodiment the euclidean distance is used. ..." at Park column 10, line 38).

Regarding claims 6 and 17, the coordinate axes are scaled to equalize the variances of the data along each axis ("The features that we propose to use in our segmentation scheme belong to four groups (color, motion, position, and texture). Each one is characterized by quite different ranges of possible values: color information typically ranges from 0 to 255, motion spans a more limited interval (for example, pixels/frame), the x and y coordinates are limited by the size of the image, while the texture information shows the biggest variations. In order to process this information in parallel, it is therefore necessary to introduce some form of normalization that allows us to define a distance which is easily measurable" at Castagno page 565, right column, bottom paragraph. The variance is used in equation 3 at page 565).

Regarding claims 7 and 18, the coordinate axes are scaled in order to minimize the product of errors evaluated along each axis, with the constraint that the scaling factors sum to a constant value ("In the experiments, we gave a weight of 10% to the position information (x and y coordinates), and 5% to the texture information. The motion and the color information adaptively share the remaining 85% according to their reliability, with the qualitative behavior shown in Fig. 8" at Castagno page 568, right column, line 3. Thus, the total weighting sum is 100% and "allocates relative weight to features according to their local degree of reliability" at page 566, left column, line 25. The reliability i.e. minimize the product of errors is discussed at page 567, in Section III-E3 "Confidence Measure Derived from the Optical Flow Estimation Method").

Regarding claims 8 and 19, the distance measure is a Mahalanobis distance (discussed in claim 1, "...A common solution is known as Mahalanobis distance ..." at Castagno page 565, right column, line 41).

Regarding claim 22, the feature values include pixel values and motion vector values ("We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information ..." at Castagno page 565, left column, bottom paragraph; wherein the displacement values will form the motion vector).

Regarding claim 24, each pixel is chosen to be a member of a single segment determined by minimizing the distance measure ("... An input vector is allocated to a cluster to which it has a minimal euclidean distance with the cluster's prototype vector ..." at Park column 10, line 42.

Regarding claim 25, the number of segments is chosen by the user ("We define a region as an area of the frame which homogeneous according to given quantitative criteria, such as gray level, color, texture, motion, or—in the most general case—a combination of them" at Castagno page 564, left column, line 1. Thus, the user defines regions of the frame).

Regarding claim 26, the number of segments is chosen as a function of the input data ("Our definition of object is in full accordance with the concept of video object as defined in the framework of MPEG-4, 'an entity in a scene that a user is allowed to access (seek, browse), and manipulate (cut and paste)' ... objects are strongly characterized by their semantic content ..." at Castagno page 564, left column, line 7. See also "In one implementation for a sequence of image frames, such filtering allows for improved image object tracking ability and improved image object segmentation" at Park column 2, line 46. Thus, the quality and characteristic of data can affect the number of segments).

Regarding claim 27, the number of segments is chosen so that the variance of an overall error measure approaches a predetermined value ("...introduction of a spatial constraint that biases the algorithm so as to encourage adjacent pixels to be assigned to the same class. The proposed modification, called constrained fuzzy C-means (CFCM) ... In our approach, the standard FCM algorithm is used to obtain an initial segmentation, and the spatial constraint is introduced in a second round of iterations aimed at refining the result" at Castagno page 568, right column, line 22).

Regarding claim 29, the representations of segments in the vector space are updated according to the segment membership of pixels ("As is the case for the FCM algorithm, the fuzzy partition of the data set can be obtained by iteratively updating the centroids and the degree of belongingness of each vector to the classes" at Castagno page 568, right column, line 32. This is to say that the fuzzy partition of the data set which represents the segment in the vector space is updated according to the degree of belongingness of each vector to the classes).

Regarding claim 30, the processes of assigning pixels to segments and of updating the representations of segments are repeated alternately ("As is the case for the FCM algorithm, the fuzzy partition of the data set can be obtained by iteratively updating the centroids and the degree of belongingness of each vector to the classes" at Castagno page 568, right column, line 32. This is to say that the degree of

belongingness of each vector which assigns pixels to segments and the centroids of the fuzzy partition of the data set which represents the segment are iteratively updated).

Regarding claim31, the initial segmentation is taken from the previous picture in a sequence of pictures ("...The segmentation results obtained for the current frame are eventually used as initialization for the FCM procedure at frame n+1 ..." at Castagno page 568, right column, line 42. Thus, the initial segmentation is taken from the previous picture).

Regarding claim 20, a segmentation system comprising the steps of:
scaling the image data so as substantially to equalize the variance of the data in at least one dimension of the pixel address and each dimension of the feature value ("The features that we propose to use in our segmentation scheme belong to four groups (color, motion, position, and texture). Each one is characterized by quite different ranges of possible values: color information typically ranges from 0 to 255, motion spans a more limited interval (for example, pixels/frame), the x and y coordinates are limited by the size of the image, while the texture information shows the biggest variations. In order to process this information in parallel, it is therefore necessary to introduce some form of normalization that allows us to define a distance which is easily measurable" at Castagno page 565, right column, bottom paragraph. The variance is used in equation 3 at page 565);

initially assigning pixels to segments (as depicted in Castagno figure 2, pixels are assigned to segments: "For the sake of simplicity, we have selected a case in which the coherence within each region is based on gray level and color" at Castagno page 564, right column, line 1);

representing each segment as a location in the segmentation vector space (as depicted in Castagno figures 3-5: "Figs. 3–5 show three examples of how the same segmentation at the region level can yield different segmentations at the object level" at page 564, right column, line 4. See also "We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information ..." at page 565, left column, bottom paragraph);

determining the membership of a segment for each pixel according to the distance the segmentation vector space from the data point representing the pixel to the location of the segment (discussed in claim 1, for the determination of the membership of a segment).

8. Claims 5 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno and Park as applied to claim 1 discussed above, and further in view of Aggarwal et al. (US 6,728,706 B2).

Regarding claims 5 and 16, the Castagno and Park combination teaches that the distance used can be Euclidean or Mahalanobis. The Castagno and Park combination does not explicitly teach the Manhattan distance.

Aggarwal, in the file of endeavor of image similarity search ("Similarity searches are performed on the basis of similarity functions" at column 4, line 24), teaches distance metrics, such as Manhattan distance, used to determine the similarity during search phase: "In this feature space, each product is represented by a feature vector corresponding to the feature values extracted for it in step 240 *(figure 2)*" at column 7, line 8. Furthermore, "feature values in the database will have different ranges, for example, (maximum value over the entire database--minimum value over the entire database). Consequently, features with a larger range dominate over a feature with smaller range when, for example, Manhattan, Euclidean, or Mahalanobis distance metrics are used for determining the similarity between two products during the search phase" at column 7, line 46.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to be motivated to include the segmentation system of the Castagno and Park combination with Manhattan distance metric as taught by Aggarwal, not only for its mathematical simplicity and calculatingly fast but also to ensure that "none of the features are given undue importance when calculating similarity metrics" at column 7, line 59.

9. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno and Park as applied to claim 1 discussed above, and further in view of Globus et al. (US 4,078,860).

Regarding claim 21, the Castagno and Park combination teaches:
representing the image data as points in a segmentation vector space which is the product of the vector space of feature values and the vector, space of pixel addresses (as depicted in Castagno figure 2, "Fig. 2 shows a segmentation at the region level. For the sake of simplicity, we have selected a case in which the coherence within each region is based on gray level and color" at page 564, right column, line 1. See also "We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information ..." at page 565, left column, bottom paragraph); initially assigning pixels to segments represented as locations in the segmentation vector space (as depicted in Castagno figures 2-5: "Fig. 2 show a segmentation at the region level. For the sake of simplicity, we have selected a case in which the coherence within each region is based on gray level and color" at Castagno page 564, right column, line 1. The assigned segments will be represented as locations in the segmentation vector space: "Figs. 3–5 show three examples of how the same segmentation at the region level can yield different segmentations at the object level" at page 564, right column, line 4. See also "We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB,

and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information ..." at page 565, left column, bottom paragraph);

determining the membership of a segment for each pixel according to a distance measure from the data point representing the pixel to the representation of the segment (discussed in claim 1, for the determination of the membership of a segment).

The Castagno and Park combination does not explicitly teach the toroidal canvas.

Globus, in the field of endeavor of image projection ("projected in a complete circle about the spectator's position onto a drum-type screen" at column 1, line 6), discloses an improved cycloramic projection system "The essentials of the novel optics system are a single light source producing a circular beam of light, a single toroidal convex lens concentric with the optical axis, and a single strip of film curved into a circle also concentric with the optical axis and which is located within the toroidal lens and surrounds a cone-shaped reflecting surface also concentric with the optical axis that functions to turn the light beam radially outward throughout a complete circle and pass through the film thus to condense the image on the film into a ring of light which is intercepted by the toroidal convex lens resulting in the projection of a focused image completely around the circular screen" at column 1, line 42.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to be motivated to include the segmentation system of the Castagno and Park combination with pixels in a toroidal canvas as taught by Globus, such that a "

non-distorted, and reliable image to be produced in a completely circular mode" at column 1, line 41.

10. Claims 23, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno and Park as applied to claim 1 discussed above, and further in view of Bierling et al. (US 4,771,331).

Regarding claim 23, the Castagno and Park combination teaches various components for the feature vector. The Castagno and Park combination does not explicitly teach the displaced frame differences as one of the feature values.

Bierling, the same field of endeavor of reconstruction of television sequences ("to provide an improved method of motion compensating field interpolation" at column 2, line 1), discloses a technique "provides uniquely defined displacement vector fields which are valid for the temporal positions of the fields to be interpolated, rather than for the transmitted fields. This further reduces the jerkiness in the motion compensating interpolated sequence" at column 3, line 25. Wherein, "Each displacement vector is determined in such a way that it connects two picture elements of two available fields and crosses the spatial position of the picture element to be interpolated" at column 5, line 32. The detailed displacement estimator is discussed at column 5, line 44. Mainly, as shown in figure 2 "… a moving object caused a frame difference signal FD, where $FS(x,y) = S_k(x,y) – S_{k-1}(x,y)$. Compensating the displacement by an estimated displacement vector D^ with the components dx^, dy^, the remaining frame difference, called displaced frame difference (DFD), results as $DFD(x,y,D\hat{}) = S_k(x+dx\hat{},y+dy\hat{})$ - S_{k-1}

(x,y). Under the above mentioned assumptions, the DFD approaches zero if the estimate D^ is close to the true displacement vector D ..." at column 5, line 57.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to be motivated to include the segmentation system of the Castagno and Park combination with displaced frame difference (DFD) as one of the feature values as taught by Bierling, in order to "further reduces the jerkiness in the motion compensating interpolated sequence" at column 3, line 28.

Regarding claim32, the displaced frame differences are calculated by applying motion vectors derived from the current state of the segmentation to the input pixel data ("Each displacement vector is determined in such a way that it connects two picture elements of two available fields and crosses the spatial position of the picture element to be interpolated" at Bierling column 5, line 32. Furthermore, the formula represents the displaced frame differences (DFD) is listed as equation 3 at column 5).

Regarding claim 33, the mean value of the displaced frame differences is considered to be zero for the purpose of calculating their contribution to the distance measure ("Under the above mentioned assumptions, the DFD approaches zero if the estimate D is close to the true displacement vector D. In the above mentioned Bierling paper, an estimation algorithm is derived that minimizes the local mean squared displaced frame difference" at Bierling column 6, line 1).

11. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno and Park as applied to claim 1 discussed above, and further in view of Price et al. (US 5,606,164).

Regarding claim 9, the Castagno and Park combination teaches:
representing the data as points in a segmentation vector space which is the product of the vector space of feature values and the vector space of pixel addresses (discussed in claim 1, for representing the data as points in a segmentation vector space);
representing the data as points in a segmentation vector space (discussed in claim1, for representing segments as locations in the segmentation vector space);
determining the membership of a segment for each pixel through said distance measure (discussed in claim 1, for determining the membership of a segment).

The Castagno and Park combination does not explicitly disclose the usage of covariance matrix.

Price, in the field of endeavor of data analysis ("measuring biological fluid analyze concentration using outlier identification and removal based on generalized distances" at column 3, line 12), discloses the usage of principal component analysis on the generalized distances: "... the calibration data set may be reduced to significant factors using principal component analysis or partial least squares scores, enabling calculation of regression coefficients and artificial neural network weights" at column 3, line 38. And "... generalized distance between a sample and the centroid defined by a set of samples may be determined using the variance-covariance matrix of the set of samples ... Further, by using principal component scores to represent spectral data for

each sample, independent variables maximizing the information content may be obtained, insuring an invertible approximate variance-covariance matrix. With respect to Mahalanobis distance, an approximate centroid may be determined as the centroid of a multivariate normal distribution of the set of calibration samples and an approximate variance-covariance matrix of the set of calibration samples, whereby an approximate Mahalanobis distances in units of standard deviations measured between the centroid and each calibration sample may be found ..." at column 5, line 17.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to be motivated to include the segmentation system of the Castagno and Park combination with covariance matrix application as taught by Price, such that by "using principal component scores to represent spectral data for each sample, independent variables maximizing the information content may be obtained, insuring an invertible approximate variance-covariance matrix" at column 5, line 25.

Regarding claim 10, covariance matrix (discussed at Price column 11, equation (7), where S is the covariance matrix).

Regarding claim 11, distance measurement (discussed at Price column 11, equation (6) for the Mahalanobis distances).

12. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno and Park as applied to claims 1, 25, 26, and 27 discussed above, and further in view of Penn (US 5,848,198).

Regarding claim 28, the combination of Castagno and Park teaches segmentation processing with chosen number of segments as discussed in claims 25, 26 and 27. The Castagno and Park combination does not explicitly teach that the process can be in parallel.

Penn, in the same field of endeavor of processing digitized images ("for detecting, identifying, and analyzing anomalies and abnormalities within the images" at column 1, line 12), provides "a new and improved method of and apparatus for achieving significant reduction in image data processing time by using a methodology which is amenable to parallel processing ..." at column 16, line 27. The processing involves such as "...(iii) a coded method of segmenting the Analysis Image according to the locations of the fractal-like forms. (iv) a coded procedure for obtaining a set of binary images for each segment ..." at column 7, line 61. Furthermore, "determine a relative merit of the performance measure, a 'best measure' is initialized either high or low as per the specification and stored in computer memory 32 *(figure 1)* ..." at column 26, line 39.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to be motivated to include the segmentation system of the Castagno and Park combination with parallel processing methodology as taught by Penn, for "achieving significant reduction in image data processing time" at column 16, line 18.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eueng-nan Yeh whose telephone number is 571-270-1586. The examiner can normally be reached on Monday-Friday 8AM-4:30PM EDT.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on 571-272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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